Diversity in Peer-Advice Networks and the Emergence of Collective Post-Adoptive Attitudes: A Multilevel Perspective

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Short Paper

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Abstract

Implementing new enterprise information systems (EIS) has been an important, expensive, and constant problem that research has tried to solve for years. Previous implementation research offers conflicting viewpoints on the role that social influence dynamics play in implementation success. We study one social influence mechanism, namely peer-advice networks, and examine how the diversity characteristics (separation, disparity, and variety) of these networks lead to the emergence of a collective post-adoptive attitude (either resistance or support) toward a new information system. We propose a multilevel, longitudinal study using electronic medical record systems as a context to analyze the effect of diversity on the emergence of a collective post-adoptive attitude. Our hypothesized findings will demonstrate how to leverage peer-advice networks to achieve greater success in new EIS implementations.

Introduction

Successfully implementing a new enterprise information system (EIS) is fraught with problems that research has tried to solve for years (Joshi 1991; Keen 1981; Markus 1983; Robey et al. 2002; Sykes et al. 2014). The extensive attention toward EIS implementation is due to the important role that an EIS has in a business process and the overall investment that implementations require. For example, Disney spent $400 million on a new EIS project, Hershey spent $112 million on their EIS implementation, and FoxMeyer Drug went bankrupt after a failed EIS implementation (Seddon et al. 2010). Thankfully, many research studies in this domain have provided insights to improve the implementation process. Some advancements include understanding different training processes (Robey et al. 2002), aligning the EIS to functional organizational processes (Seddon et al. 2010), and establishing champions for the implementation (Beath 1991).

Despite these positive research advancements, we still see user groups resisting EIS implementations after an organization adopts the technology (Lapointe and Rivard 2005; Venkatesh et al. 2011). Perhaps we can be better prepared to address this resistance if we have a better understanding of the mechanisms influencing post-adoptive attitudes and behaviors. For example, while Sykes et al. (2014, 2015) demonstrate that peer-advice networks significantly improve job performance and system-use at an individual level following the implementation of an EIS, Lapointe and Rivard (2005) posit that group dynamics of the organization may act as one of the triggers to resistance behaviors. Thus we see two seemingly contradictory viewpoints regarding the benefits of interpersonal social influence. We suggest that these contradictory results can be reconciled if we probe into these social dynamics and, more specifically, the characteristics of the social network that exerts this influence.

Our interest is in understanding one type of social network where these social influence dynamics are prevalent, namely peer-advice networks, and how the diversity characteristics of these networks lead to the emergence of a *collective* post-adoptive attitude toward a new information system. That is, we aim to explain how individual opinions and decisions coalesce to form a homogenous and cohesive attitude of the entire group – either one of support or resistance. While collective support toward an EIS implementation may be a benefit to organizations, collective resistance has been shown to enhance the severity of resistance behaviors (Lapointe and Rivard, 2005). It is therefore critical to understand more completely how collective attitudes form in order to prevent negative outcomes and promote positive outcomes in EIS implementations.

We are specifically interested in the role of peer-advice networks because of their ability to provide ease of access to information and shared context among employees in the network. We suggest that diversity in the peer-advice network will influence whether a collective group attitude emerges or does not emerge as well as what type of collective attitude emerges (i.e., support or resistance). We leverage the three types of diversity defined by Harrison and Klein (2007), namely the separation of post-adoptive attitudes, the disparity of influence, and the variety of roles, and apply them to peer-advice networks. We propose a multilevel, longitudinal study, using electronic medical record (EMR) systems as a context, to analyze the effect of peer-advice network diversity on the emergence of a collective post-adoptive attitude. Through this analysis we hope to answer the following research question: What is the effect of diversity in a peer-advice network on the emergence of a *collective* post-adoptive attitude in enterprise information systems implementations?

Literature Review

Peer-Advice Networks

Adopted from Sparrowe et al. (2001), peer-advice networks in this paper are defined as networks comprised of employees in a defined workplace setting (e.g., business unit) who seek and provide information, assistance, and guidance to and from one another, in response to all aspects of their job responsibilities. Peer-advice networks are made up of give- and get-ties which can determine an employee's peer-advice network centrality, or the number of connections to that particular employee (Ibarra and Andrews 1993; Sykes et al. 2014; Zagenczyk and Murrell 2009). Give-ties are the number of individuals who receive advice from a focal employee and get-ties are the number of advice relationships that the employee utilizes for information (Zagenczyk and Murrell 2009). Zhang and Venkatesh (2017) use the term *support networks* with the processes of help-seeking and help-providing, whereas Sykes et al. (2014) use the term *advice networks* with the processes of get-advice versus give-advice. For this study, we view the two terms as synonymous and use the terms advice networks with give- and get-advice.

Peer advice networks are our focus because users of a new system essentially learn from one another using an improvised learning process (Boudreau and Robey 2005). Additionally, social information processing theory suggests that employees develop attitudes as a result of information they receive through networks and adapt this information to reflect the reality of their own situations (Ibarra and Andrews 1993; Zagenczyk and Murrell 2009). In EIS implementations, the employees that are early adopters tend to become more central in the workplace due to give- and get-ties. More centrality allows them greater access to valuable work related information (Burkhardt and Brass 1990; Sykes et al. 2014). Also, if an individual is embedded in a particular peer-advice network, he or she is more likely to understand the work and the requirements needed to complete his or her job (Zagenczyk and Murrell 2009).

During implementations of a new EIS, peer-advice networks appear to play a positive role in system use (Sykes et al. 2009; Venkatesh et al. 2011), job performance (Qiu et al. 2014; Sykes et al. 2014), work-unit commitment (Zagenczyk and Murrell 2009), and job satisfaction (Zhang and Venkatesh 2017). From the review of the literature in information systems and organizational journals, it appears that these peer-advice networks are crucial to EIS implementation success. Yet an assumption surrounding these peer-advice networks is that the information shared is always positive and accurate. Positive and accurate information may not always be the case. Information shared in the network may be negative when a group

initially implements a system (Boudreau and Robey 2005). Our extensive review of peer-advice networks, however, does not find instances that look at the negative effects of peer-advice networks.

Emergence of Collective Post-Adoptive Attitudes: Collective Resistance and Collective Support

This study focuses on post-adoptive attitudes – namely resistance or support toward the implementation. Often, resistance is compared with adoption, yet these concepts do not lie on the same spectrum because adoption and resistance can coexist in mandatory settings (Bhattacherjee et al. 2018). van Offenbeek et al. (2013) clarify the discrepancy of resistance and adoption by proposing two spectrums that interact. One is resistance versus support, and the other is use versus non-use. For the purpose of this study, we will focus on the spectrum regarding resistance versus support. Non-resistance can also exist on this spectrum where the user neither supports nor resists the technology.

Resistance is defined as "Behaviors intended to prevent the implementation or use of a system or to prevent system designers from achieving their objectives" (Markus 1983, p. 433). This is just one definition as resistance has been thoroughly addressed in many studies (for a complete and summarized review, see Lapointe and Rivard 2005 p. 456). Resistance can be broken down into the following elements: a subject resisting, the subject's initial conditions, the perceived threats of the subject, the resistance behaviors of the subject, and the object that is being resisted. The subject resisting and the object being resisted can change over time as Lapointe and Rivard (2005) show in their seminal paper on multilevel resistance. Identifying the subject of resistance is important in understanding the emergence to collective resistance. Different individuals thinking "*I* resist" changes to "*we* resist."

Support is the opposite of resistance, and is defined as the enthusiastic cooperation of users with system implementers. We use the term *support* instead of acceptance in this study. While much of past research has looked at acceptance (Venkatesh et al. 2003), van Offenbeek et al. (2013) shows that acceptance looks more at system use rather than a user's positive affect toward the system. To remain consistent with our post-adoptive attitudes, we focus on attitudes that support the system (support) and attitudes that oppose the system (resistance).

Cases in resistance literature show evidence of independent *individual-level* resistance attitudes coalescing to form *group-level* resistance. For example, in Lapointe and Rivard (2005), doctors resisting a new EIS created a coalition against the software, and the presence of the group appeared to be the mechanism that spurred the resistance behaviors. Their study does not investigate in detail how the characteristics of the group influenced the process of coalescence; they focused only on the presence of such a group. Moreover, our extensive literature review did not find studies that examine what group social network characteristics determine how *collective* post-adoptive attitudes emerge. We aim to address that gap in knowledge. The purpose of this study is not to analyze the nature and outcomes of resistance or support, rather the process by which individual resistance or support attitudes emerge into a collective attitude.

Theoretical Development

Concept	Definition	Source
Individual Level		
Resistance Attitudes	A predisposition towards preventing the implementation or use of a system or preventing system designers from achieving their objectives.	(Lapointe and Rivard 2005; Markus 1983)
Support Attitudes	A predisposition towards cooperating with system implementers and promoting the implementation or use of a system.	(van Offenbeek et al. 2013)

Multi-Level		
The Emergence of Collective Post-Adoptive Attitudes	The composition process by which individual, independent post-adoptive attitudes coalesce into a *shared* group post-adoptive attitude – whether resistance or support.	(Lapointe and Rivard 2005)
Collective (Group) Level		
Peer-advice Networks	Networks comprised of employees in a defined workplace setting (e.g., business unit) who seek and provide information, assistance, and guidance to and from one another, *in response to all aspects of their responsibilities*, in order to perform their jobs.	(Sparrowe et al. 2001)
Collective Post-Adoptive Attitude	A shared, homogenous, attitude of a group toward a selfsame object to the extent that the attitude of an individual can be characterized by the attitude of the group.	(Klein et al. 1994; Lapointe and Rivard 2005)
Variety of Roles	The unique representation of functional roles within a peer-advice network.	(Harrison and Klein 2007)
Disparity of Influence	The amount of inequality of the socially valued asset of influence in a peer-advice network.	(Harrison and Klein 2007)
Separation of Resistance Attitudes	The variability of the different attitudes toward a new implemented system in a peer-advice network.	(Harrison and Klein 2007)

Table 1. Key Definitions

Lapointe and Rivard (2005) demonstrate that resistance is a multi-level phenomenon existing at both the individual level as well as the group level. Specifically, they highlight the processes of compilation and composition. Compilation is demonstrated by a group of individuals, with similar or differing views, that remain independent from one another over time. Composition however, is where the views of once independent individuals come together to form a *shared view* in a unified group. The focus of the current work is in understanding the composition process – how independent individuals and their individual post-adoptive attitudes coalesce over time to develop a shared homogenous attitude of resistance or support to the extent that an attitude of an individual group member can be characterized by the attitude of the whole group (see Figure 1). Thus, our dependent variable is a binary variable, and is simply defined as whether a collective attitude among the peer-advice network is present or not.

Lapointe and Rivard (2005) explain that there are "triggers," or actions in system use, that modify either the set of initial conditions, the subject of resistance or the object of resistance. In their study, the subject of resistance transformed from individuals to a collective group, and the object of resistance shifted from the EIS to the system implementers. We posit that one mechanism that creates these triggers is the social interactions in a peer-advice network. Peer-advice networks provide an informal platform for sharing information that gives users ease of access to information, promptness of information, and a shared context between users (Sykes 2015; Sykes et al. 2014). Therefore, it is not only the presence of peer-advice networks that influence the emergence of a collective post-adoptive attitude, but rather the characteristics of the peer-advice network such as the distribution of positive and negative attitudes toward the new system.

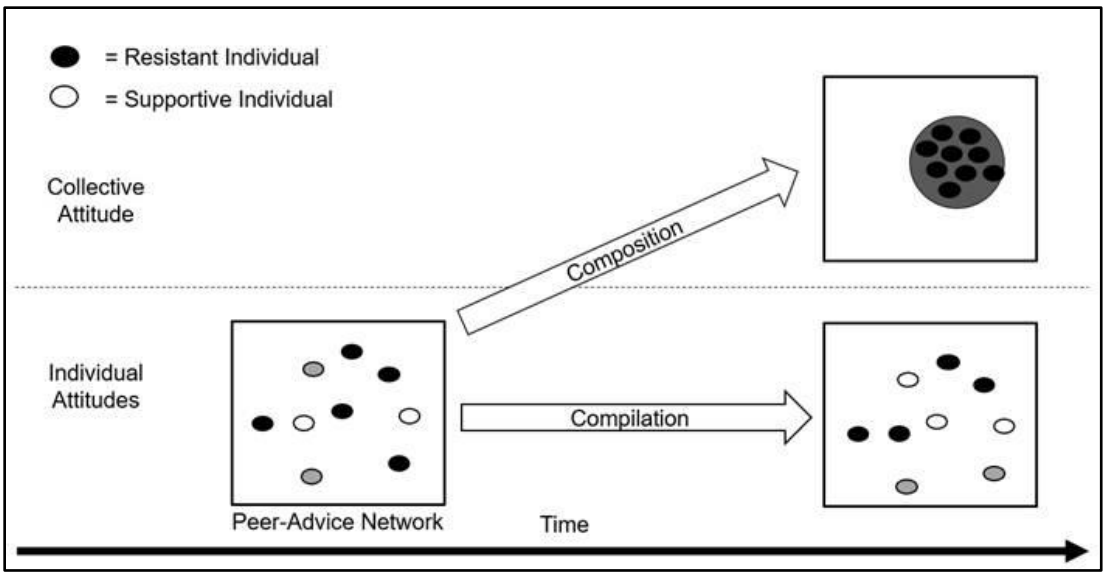

Figure 1. Multilevel Research Model: Emergence to a Collective Attitude

Our main argument, therefore, is that peer advice networks are not monolithic entities but rather they are characterized by a diverse distribution of individual post-adoptive attitudes, by differing levels of influence of individual peers in the network, and by different roles. As such, the diversity characteristics of a peer-advice network are what determine the ultimate emergence or lack of emergence of a collective shared post-adoptive attitude. These diversity characteristics of peer-advice networks, drawing from Harrison and Klein (2007), include the separation of attitudes, the variety of functional roles, and the disparity of influence. The effect of these diversity characteristics in peer-advice networks is what we plan to uncover in this study. The next sections address each characteristic of diversity and include illustrations of the maximum and minimum values (Figure 2). The hypotheses included in this paper are organized by each one of these diversity characteristics, and are demonstrated in our research model (Figure 3).

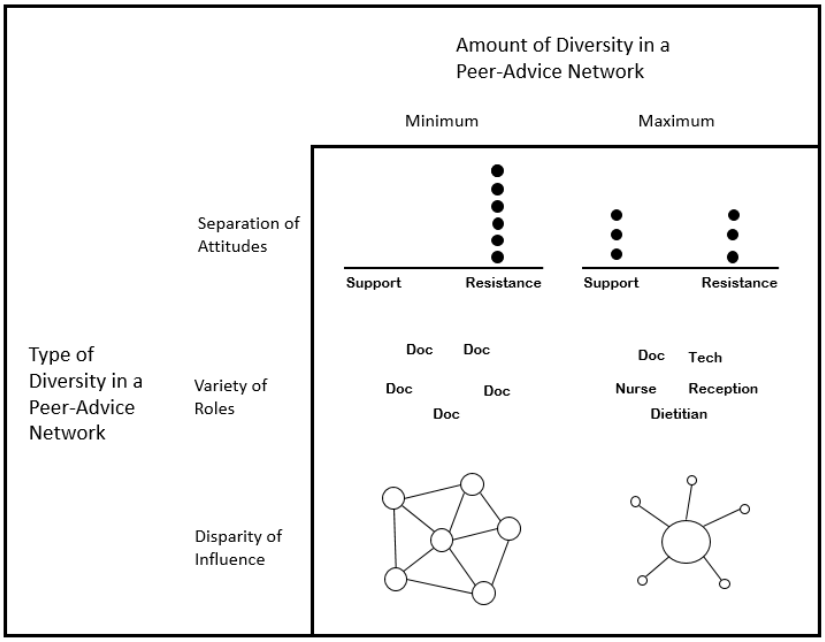

Figure 2. Diversity Characteristics (adapted from Harrison and Klein, 2007)

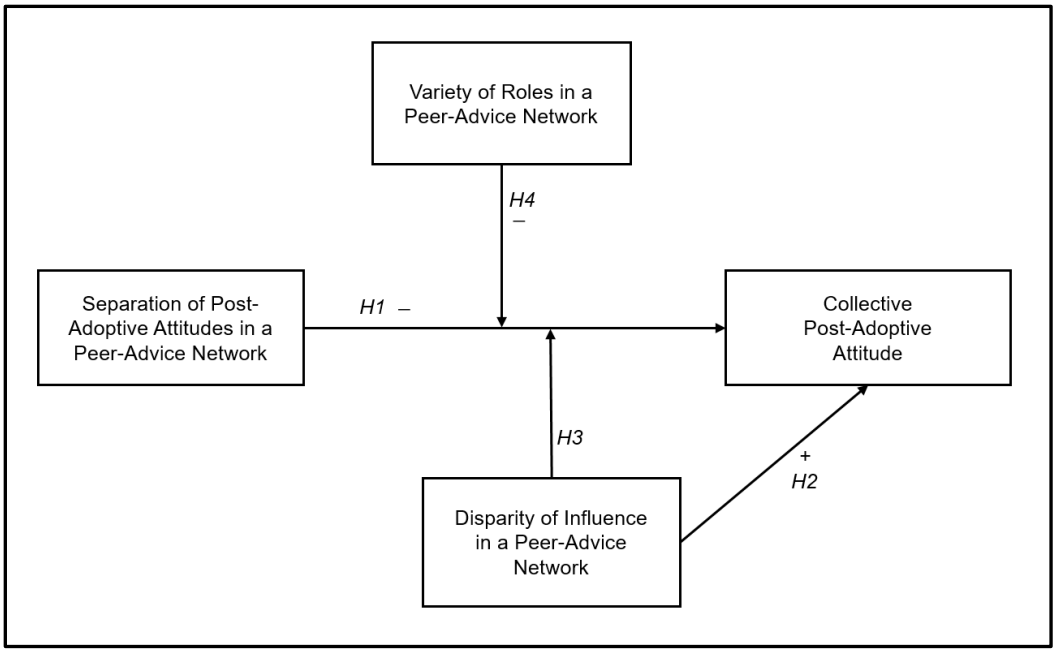

Figure 3. Theoretical Model

Separation of Attitudes

Separation of attitudes is defined as the variability of attitudes toward a new EIS in a peer-advice network. Maximum separation of post-adoptive attitudes is evident when half of the system users have an attitude of resistance toward the new EIS and the other half have an attitude of support. If the peer-advice network has minimal separation of attitudes, for example the majority opposes the system, then we would expect the network to more likely form a *collective* and homogenous attitude of resistance. If, on the other hand, maximum separation exists then we would expect no such emergence of a *collective* attitude in the network. This is because peer-advice networks distribute information and attitudes in a workplace. With new EIS implementations, information is distributed among users who are learning a new system and starting to develop attitudes about that system. According to the theory of social comparison, people are characterized by the tendency to compare their attitudes with those of others and are often inclined to alter their individual opinions and behaviors as a result of such comparison with other people (Festinger 1954). According to this theory, as users in a peer-advice network hear opinions of the new EIS by members of the network they will adapt their own opinions and attitudes to match the information received. If the information flowing in the social network is largely positive or negative, then each user will receive consistent information from the social network. Over time, this will solidify social network opinions towards shared attitudes and behaviors, thus forming a collective post-adoptive attitude. If, however, the opinions in the social network are diverse, each user will receive conflicting information. Furthermore, different users may receive a different mix of positive and negative information. As such, no collective post-adoptive attitude will emerge.

H1: The higher the separation of post-adoptive attitudes toward a new EIS in a peer-advice network, the less likely the emergence of a collective post-adoptive attitude.

Disparity of Influence

The disparity dimension of diversity is defined as the inequality of socially-valued resources held among unit members (Harrison and Klein 2007). In our context of peer-advice networks, the socially-valued resource of interest is influence – demonstrated by out-degree centrality, or how much information is

shared. Peer advice networks may give and get information equally, and others may have one to a few central node(s) that act as a hub of information sharing. To illustrate, maximum disparity of influence in a peer-advice network is one or a few central nodes giving information while most of the network only receives information. In contrast, if each node in a network shares information equally then there is minimum disparity of influence in the network. We derive two hypotheses based on disparity.

First, we expect that a collective post-adoptive attitude is more likely to emerge in a maximum disparate network than a minimum disparate network. We make this claim based on an analysis of social network theory in regard to peer-advice networks by Ibarra and Andrews (1993). If an individual displays more out-degree centrality (which is defined as the number of ties to which a user gives information), then he or she has more influence on the network, and perceptions of the network attitude stem from the attitude of this central node(s). This is due to the fact that when information flows from one main source in a peer-advice network, there is less dialectical exchange – increasing the probability that the network will adopt the specific collective post-adoptive attitude that matches that of the one or few influential peers.

H2: The higher the disparity of influence in a peer-advice network, the more likely the emergence of a collective post-adoptive attitude characterized by the central node(s) in the network.

Second, we expect that the disparity of influence should moderate the effect of the separation of attitudes. We expect low disparity to have no effect on the relationship between separation of attitudes and a collective attitude since influence is equally distributed in the network. However, we expect a complex moderating effect in cases of high disparity as follows. In a peer-advice network that has high disparity and maximum separation, (the latter suggesting a collective attitude is not likely to form), the members of the network might not be aware of others' independent conflicting post-adoptive attitudes if most are influenced by one same individual. This may lead to the emergence of a collective attitude despite high separation in the social network. However, in scenarios of *high* disparity and *low* separation, the attitude(s) of the central node(s) may agree or disagree with the overall attitude of the network. In cases of agreement, we expect the advice from the central node(s) will strengthen the effect of separation of attitude towards the emergence of a collective attitude. However, in cases where the central node(s) disagrees with the individual attitudes, we expect the contradictory advice to weaken the effect of separation of attitude.

H3: Disparity of influence in the social network will moderate the effect of separation of attitudes on the emergence of collective post-adoptive attitude in the manner described above.

Variety of Roles

Finally, the last dimension of diversity, according to Harrison and Klein (2007), is variety, defined in our context as the unique representation of functional roles within a peer-advice network. For example, in a medical context, a peer-advice network with maximum variety of roles is a network composed of all different roles – i.e. a doctor, a tech, a nurse, a billing manager. Conversely, minimal variety in a peer-advice network would be composed of all doctors. Variety is generally a positive characteristic of diversity and leads to positive outcomes (Harrison and Klein 2007). Variety increases the amount of dialectical exchange in a network. Or in other words, a difference of roles will bring a difference in opinions about an information system that is used by the network. Because of this dialectical exchange, we expect that a peer-advice network with greater variety of roles will weaken the negative effect of separation of attitudes on the emergence of a collective post-adoptive attitude. In one case study given by Lapointe and Rivard (2005), the doctors resisted the system, but the nurses accepted and approved of the system. This scenario shows different roles seeing different sides of the software. If these individuals were in the same peer-advice network, then variety could have prompted dialogue to stop or slow the emergence of a collective resistance attitude.

H4: The higher the variety of roles in a peer-advice network, the weaker the negative effect of the separation of individual resistance attitudes on the emergence of collective resistance attitudes.

Proposed Method

We will study how diversity in the peer-advice network influences the emergence of a collective post-adoptive attitude by examining the implementation of Electronic Medical Record (EMR) systems in hospitals and other medical facilities. EMR systems are EIS that act as a central tool to store and track patients' records and assist the medical practice by streamlining processes formerly managed on paper. These systems are designed to promote health care savings and reduce medical errors (Hillestad et al. 2005). Because of the importance of EMR systems, practices are willing to switch systems to ensure that the system is accomplishing their practice goals. Additionally, a new EMR system affects many different user types such as the front office staff, nurses, dietitians, and doctors.

We propose a mixed-method study that leverages both qualitative and quantitative methods to account for limitations in each method. The data will be collected from ophthalmology clinics implementing the same practice management system (a top ophthalmology EMR).

First, with a pilot medical clinic, we will conduct semi-structured interviews to validate the theoretical grounding proposed in this study and use the findings to develop an appropriate validated survey. Second, using a longitudinal survey design, we will examine multiple medical clinics consisting of multiple locations. Multi-location is essential to the study as it provides a natural separation that can help distinguish peer-advice networks. Our first survey will collect social network data from each individual to identify whom they give advice to and receive advice from, following the method implemented by Sykes et al. (2014). Additionally we will collect data about attitudes and will follow the method described by (Klein et al. 1994) to distinguish between individual post-adoptive attitudes and collective post-adoptive attitudes. Specifically, 1) using measurement scales at both the individual level, and at the social network (group_ level, and 2) testing for homogeneity using the variance within and between groups. Finally, we will collect the individual's role, demographic information, and additional control variables. Our second survey at time two will administer the same survey about attitudes. The length of time to collect data at time two will be determined through the primary interviews. We will follow best practices to measure collective constructs and validate their emergence and presence (Chan 1998; Klein et al. 1994; Kozlowski and Klein 2000). Using quantitative data gathered in surveys at time one and two, we will test our hypotheses by analyzing how diversity of peer advice networks at time one influences whether a collective post-adoptive attitude has formed at time two.

Contribution and Conclusion

This study contributes to the literature on post-adoptive behaviors, peer-advice networks, and multilevel theorizing. It does so by demonstrating how the diversity characteristics of a peer-advice network affect the emergence of resistant or supportive coalitions. Organizations are multi-level in nature (Kozlowski and Klein 2000). Therefore, looking at post-adoptive phenomena with a multi-level perspective can enrich what we already know about individual post-adoptive attitudes. Specifically, we build on Lapointe and Rivard's (2005) work by providing a mechanism by which the composition process of resistance (or support) occurs – namely peer-advice networks. We further hope to demonstrate to practitioners and researchers that whether peer-advice networks lead to positive or negative effects in implementations is dependent on their diversity characteristics and that measuring these can serve as a barometer to gauge implementation success.

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